APPENDIX A – Information Considered for the August 20, 2011 Decision

Values-at-risk Identified August 19-20

The Fernberg Corridor was identified during initial assessments as the highest priority area to protect. This area includes many residences, businesses, communications sites, as well as commercial timber. Incident objectives were developed to reinforce this priority:

- Provide for firefighter and public safety
- Keep fire south of the Kawishiwi River

Below is a map of the Pagami Creek Fire showing values at risk, areas of concern, Boundary Waters Canoe Area Wilderness boundary and private property.

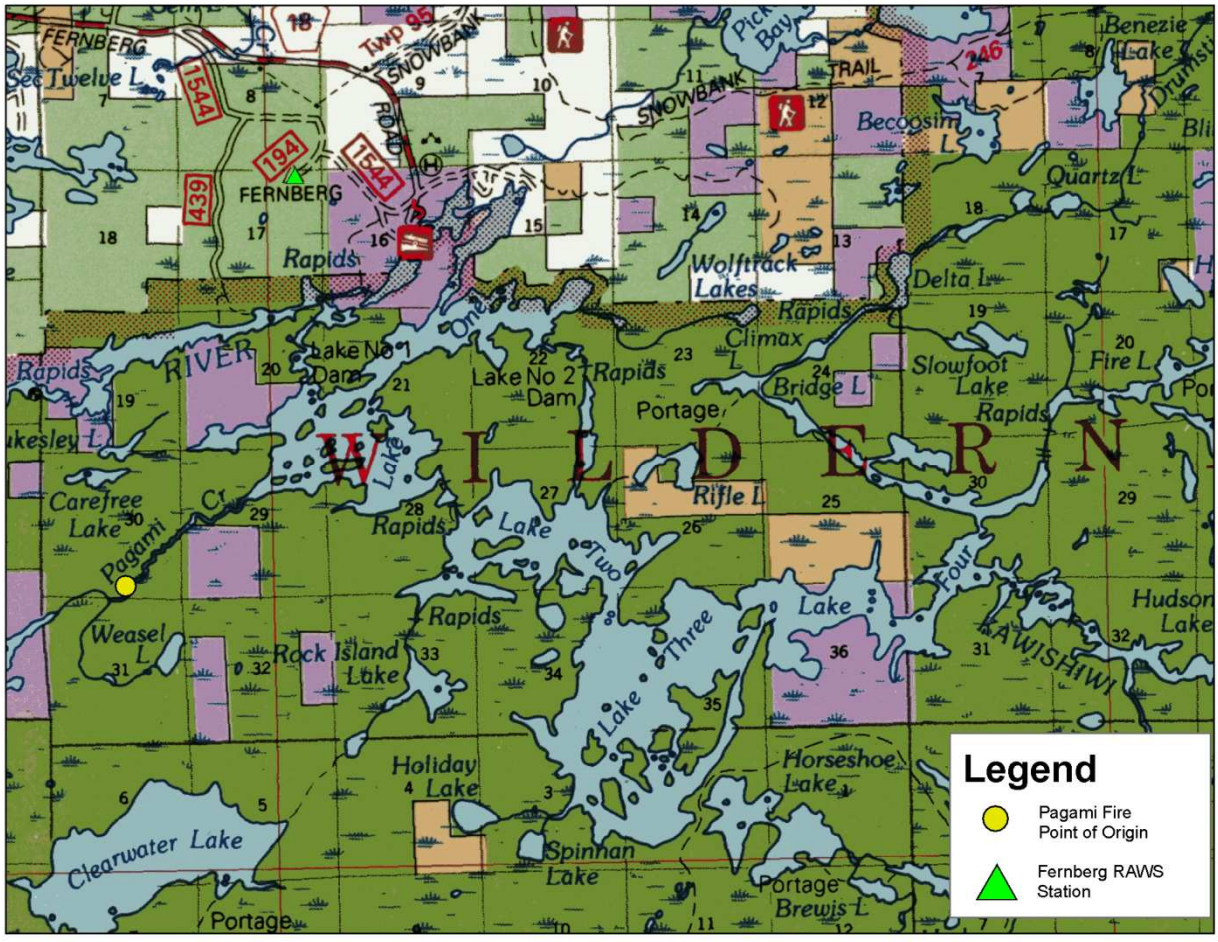

Figure A1. Pagami Creek Fire location on August 20, 2011. Note US Forest Service lands within the BWCAW is dark green. US Forest lands in the Fernberg Corridor are lighter green with road systems (private lands are shown in white).

Fuel and Topography

Aerial observations indicated that the fire was burning in grass in a boggy area with scattered brush black spruce. On August 18-20 it was believed that the fire had burned into a downed spruce tree and smoldered in it. It was later determined that the fire had burned into a dry layer of sphagnum moss and smoldered at the lower layer where increased moisture limited active fire behavior but enabled sustained combustion.

Adjacent fuels were observed to be mature jack pine with balsam fir in the understory. While the fire was currently in a lowland it was recognized that the adjacent jack pine ridges would likely be drier with more flammable fuel. Beyond the jack pine stand to north was an undulating landscape consisting of pine ridges and lowland conifers extending for 2 miles to the Kawishiwi River. The area south across Pagami Creek contained similar ridge-lowland conifers but was interspersed with deciduous patches (aspen and birch) with balsam fir in much of the understory.

Current and Forecasted Weather

Weather information considered in making the August 20, 2011 decision to monitor the Pagami Creek Fire include the daily general fire weather forecasts and "spot weather" forecasts issued by the National Weather Service (NWS) Duluth Office and records for the Ely and Fernberg Remote Automatic Weathers Stations (RAWS). Current weather was obtained from Ely and Fernberg RAWS. In addition, rainfall at those stations for the previous several weeks was reviewed.

NWS-Duluth Office General Fire Weather Forecast issued August 20, 2011 at 1504. This forecast was prepared for weather conditions for the following three days for the fire weather zone which includes Cook, Aurora and Ely, Minnesota. The information received in this forecast indicated no severe fire weather. Temperature and relative humidity were predicted to be about average for this time of year and were not considered to be particularly hot nor dry. Night time conditions were expected to be moist and cool. Chances of precipitation were forecast for that night and the following day.

Spot Weather Forecast issued by the NWS-Duluth Office at 14:57 on August 20, 2011. This forecast was developed specifically for the Pagami Creek Fire area (based on request time of August 20, 2011 at 14:31). This forecast predicted temperatures about the same as the general forecast with humidity reaching as low as 35% (slightly lower than the general forecast). Potential for thunderstorm activity was the most significant concern for causing rapid spread on the Pagami Creek Fire. It was believed that any thunderstorm activity would result in short-lived increases in fire intensity and would likely be accompanied by precipitation.

Ely and Fernberg RAWS station observations for August 19-20, 2011. These observations display hourly recordings of weather observations at the station sites. Ely RAWS is about 1t5

miles west of the Pagami Creek Fire and Fernberg RAWS is about 2 miles north of the Pagami Creek Fire. Both stations displayed wind speeds in excess of ten miles pere hour for more than 10 hours on the 19th without causing the fire to move. Other weather parameters were relatively mild weather for fire behavior.

Ely and Fernberg RAWS station daily observations for August 1 – 20, 2011. These observations are the 1300 hour records for each day from August 1 – 20. They show 1.35 inches of rain fell at Fernberg and 2.92 inches fell at Ely. Lowest RH was 32 and 35 respectively at Fernberg and Ely on August 5th. In general, the preceding weather did not display a particularly severe wind speed/relative humidity combination or anything else that would constitute a “drying” trend.

MINNESOTA FIRE WEATHER FORECAST
NATIONAL WEATHER SERVICE DULUTH, MN
304 PM CDT SAT AUG 20 2011

.DISCUSSION... SCATTERED SHOWERS AND THUNDERSTORMS WILL BEGIN TO DIMINISH BY SUNSET. EXPECTING A SIMILAR SITUATION ON SUNDAY IN REGARDS TO PRECIPITATION...THOUGH NOT AS EXTENSIVE AND FAVORING AREAS OF NORTHWESTERN WISCONSIN. NORTHWESTERLY WINDS AROUND 10 MPH WILL BE FOUND ON SUNDAY. DRIER CONDITIONS WILL BE FOUND OVER THE NORTHLAND ON MONDAY WITH WINDS LIGHT FROM THE SOUTHWEST.

ST. LOUIS...SUPERIOR NF WEST INCLUDING...AURORA...COOK...ELY

.TONIGHT...
SKY/WEATHER.....PARTLY CLOUDY. SCATTERED SHOWERS AND
THUNDERSTORMS UNTIL 2400...THEN ISOLATED RAIN
SHOWERS. CHANCE OF PRECIPITATION 30 PERCENT.
MIN TEMPERATURE.....43-48.
MAX HUMIDITY.....95-100 PERCENT.
20-FOOT WINDS.....WEST WINDS 3 TO 6 MPH IN THE EVENING BECOMING
LIGHT.
PRECIPITATION.....SCATTERED TRACE TO 0.05 INCH AMOUNTS.

.SUNDAY...
SKY/WEATHER.....PARTLY CLOUDY. A SLIGHT CHANCE OF RAIN SHOWERS.
A SLIGHT CHANCE OF THUNDERSTORMS AFTER 1200.
CHANCE OF PRECIPITATION 20 PERCENT.
MAX TEMPERATURE.....69-74.
MIN HUMIDITY.....38-43 PERCENT.
20-FOOT WINDS.....NORTHWEST WINDS 5 TO 10 MPH.
HAINES INDEX.....5 OR MODERATE.
HOURS OF SUN.....8 HOURS.
PRECIPITATION.....ISOLATED TRACE TO 0.05 INCH AMOUNTS.
MIXING HEIGHT.....AROUND 9400 FT AGL (AVE 12-6 PM).
TRANSPORT WINDS.....NORTHWEST AROUND 15 MPH (AVE 12-6 PM).
SMOKE DISPERSAL.....AROUND 139000 OR EXCELLENT (AVE 12-6 PM).

.SUNDAY NIGHT...
SKY/WEATHER.....PARTLY CLOUDY.
MIN TEMPERATURE.....46-51.
MAX HUMIDITY.....80-85 PERCENT.
20-FOOT WINDS.....WEST WINDS 3 TO 6 MPH IN THE EVENING BECOMING
LIGHT.
PRECIPITATION.....NONE.

.MONDAY...
SKY/WEATHER.....PARTLY CLOUDY.
MAX TEMPERATURE.....75-80.
MIN HUMIDITY.....38-43 PERCENT.
20-FOOT WINDS.....SOUTHWEST WINDS 3 TO 6 MPH.
HAINES INDEX.....5 OR MODERATE.
HOURS OF SUN.....8 HOURS.
PRECIPITATION.....NONE.
MIXING HEIGHT.....AROUND 8300 FT AGL (AVE 12-6 PM).
TRANSPORT WINDS.....WEST AROUND 11 MPH (AVE 12-6 PM).
SMOKE DISPERSAL.....AROUND 93000 OR EXCELLENT (AVE 12-6 PM).

SPOT FORECAST FOR PAGAMI CREEK FIRE...US FOREST SERVICE
NATIONAL WEATHER SERVICE DULUTH MN 257 PM CDT SAT AUG 20 2011
FORECAST IS BASED ON REQUEST TIME OF 1431 CDT ON AUGUST 20.
IF CONDITIONS BECOME UNREPRESENTATIVE...CONTACT THE NATIONAL WEATHER SERVICE.

.DISCUSSION...
WESTERLY WINDS AROUND 10 MPH THIS AFTERNOON WILL DECREASE TO 5 MPH AND LESS BY 6 PM. A BRIEF SCATTERED SHOWER OR THUNDERSTORM REMAINS POSSIBLE THROUGH THE EARLY EVENING. WINDS WILL BE VARIABLE AND GUST TO 25 PMH IN ANY THUNDERSTORM ACTIVITY. SOMEWHAT SIMILAR CONDITIONS EXIST FOR SUNDAY WITH THE WINDS COMING FROM A MORE NORTHWESTERLY DIRECTION.

.TONIGHT...
SKY/WEATHER.....PARTLY CLOUDY. SCATTERED SHOWERS AND
THUNDERSTORMS IN THE EVENING...THEN ISOLATED
RAIN SHOWERS AFTER MIDNIGHT. CHANCE OF
PRECIPITATION 30 PERCENT.
MIN TEMPERATURE.....44-49.
MAX HUMIDITY.....96 PERCENT.
WIND (20 FT).....WEST WINDS 3 TO 6 MPH IN THE EVENING BECOMING
LIGHT. GUSTY AND ERRATIC WINDS EXPECTED NEAR
THUNDERSTORMS IN THE EVENING.
MIXING HEIGHT.....950 FT AGL.
TRANSPORT WINDS.....WEST 5 TO 10 MPH.
SMOKE DISPERSAL.....GOOD (49500) DECREASING TO POOR (1050) IN THE
LATE EVENING AND OVERNIGHT.

TIME (CDT)	7 PM	9 PM	11 PM	1 AM	3 AM	5 AM
TEMP	64	56	52	50	49	48
RH	52	69	80	86	83	86
20 FT WIND DIR	W	W	W	W	W	W
20 FT WIND SPD	5	5	3	2	1	0
20 FT WIND GUST	7	6				

.SUNDAY...
SKY/WEATHER.....PARTLY CLOUDY. A SLIGHT CHANCE OF RAIN SHOWERS

SKY/WEATHER.....PARTLY CLOUDY. A SLIGHT CHANCE OF RAIN SHOWERS
THROUGH THE DAY. A SLIGHT CHANCE OF
THUNDERSTORMS IN THE AFTERNOON. CHANCE OF
PRECIPITATION 20 PERCENT.
MAX TEMPERATURE.....67-72.
MIN HUMIDITY.....35 PERCENT.
WIND (20 FT).....LIGHT WINDS BECOMING NORTHWEST 7 TO 10 MPH.
GUSTY AND ERRATIC WINDS EXPECTED NEAR
THUNDERSTORMS IN THE AFTERNOON.
MIXING HEIGHT.....300 FT AGL INCREASING TO 8900 FT AGL.
TRANSPORT WINDS.....NORTHWEST 15 TO 20 MPH.
SMOKE DISPERSAL.....POOR (12500) INCREASING TO EXCELLENT (153400).

TIME (CDT)	7 AM	9 AM	11 AM	1 PM	3 PM	5 PM
TEMP	47	55	62	67	70	69
RH	96	74	56	43	36	36
20 FT WIND DIR	W	NW	NW	NW	NW	NW
20 FT WIND SPD	1	4	7	9	8	6
20 FT WIND GUST		5	9	15	14	8

Ely RAWS: August 19-20, 2011

Date	Time(CDT)	Temp	RH	Windspeed	Precip
		° F	%	mph	in
20-Aug	19:00	64	50	8	0
20-Aug	18:00	68	45	11	0
20-Aug	17:00	69	43	6	0
20-Aug	16:00	69	43	9	0
20-Aug	15:00	**71**	**40**	10	0
20-Aug	14:00	68	41	11	0
20-Aug	13:00	65	45	11	0
20-Aug	12:00	65	44	11	0
20-Aug	11:00	65	50	9	0
20-Aug	10:00	63	68	6	0
20-Aug	9:00	58	86	5	0
20-Aug	8:00	50	98	4	0
20-Aug	7:00	47	100	3	0
20-Aug	6:00	43	100	1	0
20-Aug	5:00	44	99	3	0
20-Aug	4:00	46	100	2	0
20-Aug	3:00	47	100	1	0
20-Aug	2:00	48	92	2	0
20-Aug	1:00	53	83	3	0
20-Aug	0:00	53	80	5	0
19-Aug	23:00	56	72	4	0
19-Aug	22:00	57	70	4	0
19-Aug	21:00	60	58	5	0
19-Aug	20:00	64	50	6	0
19-Aug	19:00	68	43	11	0
19-Aug	18:00	71	43	13	0
19-Aug	17:00	72	41	14	0
19-Aug	16:00	70	41	11	0
19-Aug	15:00	72	46	13	0
19-Aug	14:00	70	47	13	0
19-Aug	13:00	70	50	12	0
19-Aug	12:00	69	65	12	0
19-Aug	11:00	67	74	16	0
19-Aug	10:00	67	87	11	0
19-Aug	9:00	65	85	12	0
19-Aug	8:00	65	82	7	0

Table A1. Hourly weather observations at Ely RAWS for August 19-20, 2011

Fernberg RAWS: August 19-20,2011

Date	Time(CDT)	Temp	RH	Windspeed	Precip
		° F	%	mph	in
20-Aug	19:00	65	39	8	0
20-Aug	18:00	68	34	9	0
20-Aug	17:00	70	30	9	0
20-Aug	16:00	72	31	8	0
20-Aug	15:00	69	33	10	0
20-Aug	14:00	71	31	11	0
20-Aug	13:00	68	35	12	0
20-Aug	12:00	69	33	13	0
20-Aug	11:00	67	45	9	0
20-Aug	10:00	64	54	4	0
20-Aug	9:00	62	65	4	0
20-Aug	8:00	56	78	0	0
20-Aug	7:00	53	78	0	0
20-Aug	6:00	51	83	0	0
20-Aug	5:00	52	81	0	0
20-Aug	4:00	53	79	0	0
20-Aug	3:00	54	78	0	0
20-Aug	2:00	55	73	0	0
20-Aug	1:00	56	68	6	0
20-Aug	0:00	58	64	6	0
19-Aug	23:00	59	59	7	0
19-Aug	22:00	60	57	7	0
19-Aug	21:00	61	56	5	0
19-Aug	20:00	64	49	8	0
19-Aug	19:00	66	46	10	0
19-Aug	18:00	71	38	12	0
19-Aug	17:00	70	40	12	0
19-Aug	16:00	72	42	11	0
19-Aug	15:00	71	41	14	0
19-Aug	14:00	72	43	13	0
19-Aug	13:00	70	51	15	0
19-Aug	12:00	67	67	12	0
19-Aug	11:00	68	71	14	0
19-Aug	10:00	66	83	12	0
19-Aug	9:00	66	82	7	0
19-Aug	8:00	64	88	4	0

Table A2. Hourly weather observations at Fernberg RAWS for August 19-20, 2011

The outlook weather forecast indicated a chance of rain for five of the following seven days after the initial size up.

Extended Forecast (August 23-25) from NWS-Duluth Office: TUESDAY...PARTLY SUNNY. A SLIGHT CHANCE OF SHOWERS AND thunderstorms. WEDNESDAY...PARTLY CLOUDY. A SLIGHT CHANCE OF SHOWERS AND thunderstorms. THURSDAY...MOSTLY SUNNY. Winds 3-8 mph.

Table shows forecasted weather for 7 days following initial size up and decision to monitor the fire (August 20 through August 26). Forecast was obtained on morning of August 20. Actual weather observations taken at the Fernberg RAWS are displayed adjacent to forecasted weather. In general, the forecast called for cooler temperatures, higher relative humidity and less wind for most days. Although precipitation was called for (at varying levels of likelihood) none was received.

Forecasted Weather and Actual Observations from Fernberg RAWS

	Temperature		Relative Humidity		Wind Direction		Wind Speed		Precipitation	
Aug	Predicted	Actual	Predicted	Actual	Predicted	Actual	Predicted	Actual	Predicted	Actual
20	69	72	55	30%	WNW	NW	11	13	30%	0
21	70	71	50	31%	NW	WNW	12	12	20%	0
22	78	84	65	31%	WSW	SSW	6	9	20%	0
23	76	82	65	47%	SSW	WSW	11	6	30%	0
24	75	68	65	56%	WNW	WNW	17	19	0	0
25	71	82	66	35%	NW	WNW	9	8	0	0
26	74	82	65	18%	SW	WNW	7	15	10%	0

Table A3. Forecasted weather for the Pagami Creek Fire area for the seven days following the initial decision to monitor the fire. Temp= maximum dry bulb temperature for the day; Humidity = minimum relative humidity for the day; Wind = dominant afternoon wind direction for the day; Speed = maximum sustained wind speed for the day; Precipitation = probability of precipitation for the day and actual amount received..

The above weather forecast information presents a picture of weather that is not supportive of large fire growth. In fact, it was believed by Superior NF managers that this weather would likely result in the Pagami Creek Fire smoldering and remaining confined to an acre or two along Pagami Creek. The actual weather displays a gradual drying trend with a spike in fire danger due to very low relative humidity coupled with high temperature and strong winds.

FERNBERG RAWS											
Date	Time(CDT)	Temperature	Relative Humidity	Wind	Precipitation	FFMC	DMC	DC	ISI	BUI	FWI
1-Aug	13:00	87	44	6	0	90.5	46.3	239.6	7.5	62.4	20.4
2-Aug	13:00	78	73	11	0.25	66.1	29.4	233.1	1.3	44.7	3.7
3-Aug	13:00	78	40	8	0	86.3	32.7	240.7	4.8	48.8	12.7
4-Aug	13:00	87	33	6	0	91.7	37.1	249.2	8.9	54.1	21.3
5-Aug	13:00	86	32	5	0	92.4	41.5	257.6	9	59.1	22.4
6-Aug	13:00	75	52	5	0	89.9	44	264.9	6.3	62.2	17.9
7-Aug	13:00	77	50	4	0.53	64.2	22.9	236.3	0.7	36.8	1
8-Aug	13:00	79	52	9	0	83.9	25.6	244	3.8	40.6	9.4
9-Aug	13:00	60	86	16	0.14	57.7	19	243.8	1.3	31.8	2.6
10-Aug	13:00	72	38	11	0.03	83.2	22	250.8	4.1	36.1	9.3
11-Aug	13:00	82	34	7	0	90.6	25.9	258.8	8.3	41.5	17.6
12-Aug	13:00	80	44	4	0.1	81.2	24.5	266.6	1.8	39.8	4.6
13-Aug	13:00	76	52	5	0	86.4	27	274	3.8	43.4	9.8
14-Aug	13:00	80	38	7	0	90.1	30.6	281.8	7.7	48.1	18
15-Aug	13:00	83	42	5	0	90.2	34.1	289.9	6.6	52.7	16.9
16-Aug	13:00	82	51	9	0.01	90.1	37	297.9	9	56.5	22
17-Aug	13:00	75	33	15	0.26	80.1	24.9	288.1	3.9	40.9	9.6
18-Aug	13:00	77	39	4	0	88.3	28.2	295.6	4.6	45.5	11.9
19-Aug	13:00	70	51	15	0.03	86.5	30.4	302.4	8.7	48.6	19.9
20-Aug	13:00	68	35	12	0	89.5	33.2	309	10.6	52.4	23.8
					1.35						

Table A4. Daily weather observations at Fernberg RAWS for the days in August 2011 preceding the decision to monitor the Pagami Creek Fire. Note: rainfall total for August 1-20 = 1.35 inches with 0.30" occurring in the preceding three days.

ELY RAWS											
Date	Time(CDT)	Temperature	Relative Humidity	Wind	Precipitation	FFMC	DMC	DC	ISI	BUI	FWI
1-Aug	13:00	80	58	11	0.21	74.7	26.5	292.8	1.8	43.2	5
2-Aug	13:00	80	74	11	0.22	65.6	17.6	287.1	1.3	30.6	2.6
3-Aug	13:00	79	39	8	0	86.6	21	294.8	5.1	35.7	11.1
4-Aug	13:00	83	44	10	0	89.5	24.4	302.9	9	40.6	18.5
5-Aug	13:00	88	35	3	0	91.7	28.7	311.5	7	46.7	16.5
6-Aug	13:00	75	62	3	0	88.4	30.7	318.8	4.3	49.4	11.8
7-Aug	13:00	74	58	6	0.1	76.3	27.5	326	1.4	45.4	3.7
8-Aug	13:00	77	61	15	0	84.8	29.6	333.5	6.9	48.5	16.6
9-Aug	13:00	63	77	19	0.08	73	27.2	339.6	3.2	45.4	8.8
10-Aug	13:00	70	48	11	0.01	85	29.6	346.4	5.1	48.8	13.4
11-Aug	13:00	78	41	10	0	89.3	32.8	354	8.7	53.3	20.8
12-Aug	13:00	78	56	7	0.22	71.7	22.4	345.9	1.2	38.6	2.7
13-Aug	13:00	74	67	6	1.96	50.3	9.4	199.5	0.3	16.9	0.2
14-Aug	13:00	77	47	9	0	81.4	12.3	207	2.7	21.4	4.6
15-Aug	13:00	80	51	9	0	87.3	15.1	214.8	6	25.7	10.7
16-Aug	13:00	79	63	16	0	87.3	17.2	222.5	10.7	28.8	17.7
17-Aug	13:00	74	41	17	0.12	82.6	15.7	225.4	6.1	26.8	11
18-Aug	13:00	75	63	4	0	84.9	17.6	232.7	2.9	29.6	6
19-Aug	13:00	70	50	12	0	87.1	19.9	239.5	7.5	32.9	14.5
20-Aug	13:00	65	45	11	0	87.8	22.1	245.8	7.7	36.1	15.4
					2.92						

Table A5. Daily weather observations at Ely RAWS for the days in August 2011 preceding the decision to monitor the Pagami Creek Fire.

Note: rainfall total for August 1-20 = 2.92 inches. Average for the entire month of August for this station is 3.35". The Build Up Index indicated an overall lower fire danger on August 20 than on August 1. The Initial Spread Index (ISI) and Fire Weather Index (FWI) are higher on August 20 than August 1, however, these indices are sensitive to wind and fluctuate significantly from day to day. Although the Drought Code (DC) increased steadily from August 1st it was still within values with prescribed fire operations. Seasonal graphs of DC indicate that this index generally peaks in late August and then gradually declines throughout the fall. Seasonal predictive Service forecasts indicated that the Fall of 2011 would be within average conditions and would likely experience a gradual decline in DC and BUI.

Fire Danger

It is common for fire danger indices and long term outlooks for weather and other seasonal factors to provide information which is not completely consistent. Decision-makers evaluate risk by reviewing all information and judging the relative importance of each indicator based on experience. The following pages display fire danger indices and other predictive information along with explanations of their relevance to fire behavior.

Ely RAWS Canadian Fire Danger Indices (Based on Actual Weather)			
	BUI	FWI	ISI
August 19	32.9	14.5	7.5
August 20	36.1	15.4	7.7

Table A6. Canadian Fire Danger Indices for August 19-20, 2011 based on weather observations at Ely RAWS.

Ely is the station most representative of conditions on the Pagami Creek Fire. The conditions listed above are well within the parameters typically occurring during prescribed fire operations in the BWCAW.

The graph below (taken from FireFamily Plus *V4.1*) shows the Buildup Index (BUI) values for 2011 compared to minimum, average, and maximum values. The BUI is a Canadian Fire Danger Index that gives a numerical rating of the total amount of fuel available for combustion. It combines the Duff Moisture Code and the Drought Code. A BUI above 59 indicates active fire behavior. The BUI of 36 for August 20 is consistent with the observations of low fire intensity.

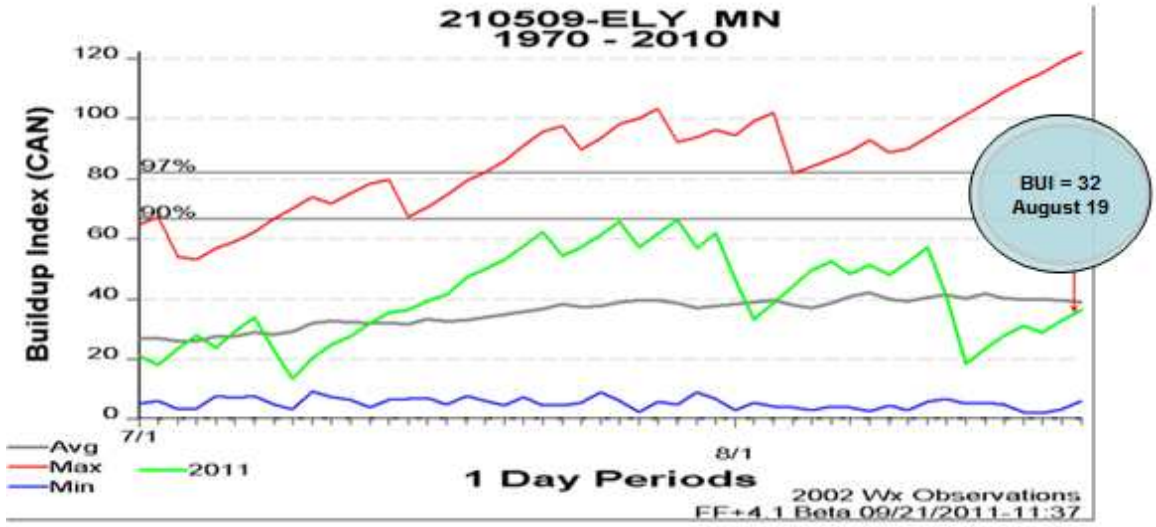

Figure. A2. Build Up Index for based on weather observations at Ely RAWS.

By late August, Energy Release Component, 1000 hour, 10 hour fuels, and Duff Moisture Code had reached values that are about average for this time of year (the green line indicates 2011 values). Note in tables below that the seasonal average line (gray) tends to experience the peak fire danger severity for all parameters around the end of August. Even peak fire danger events (red line) tend to diminish after the first of September.

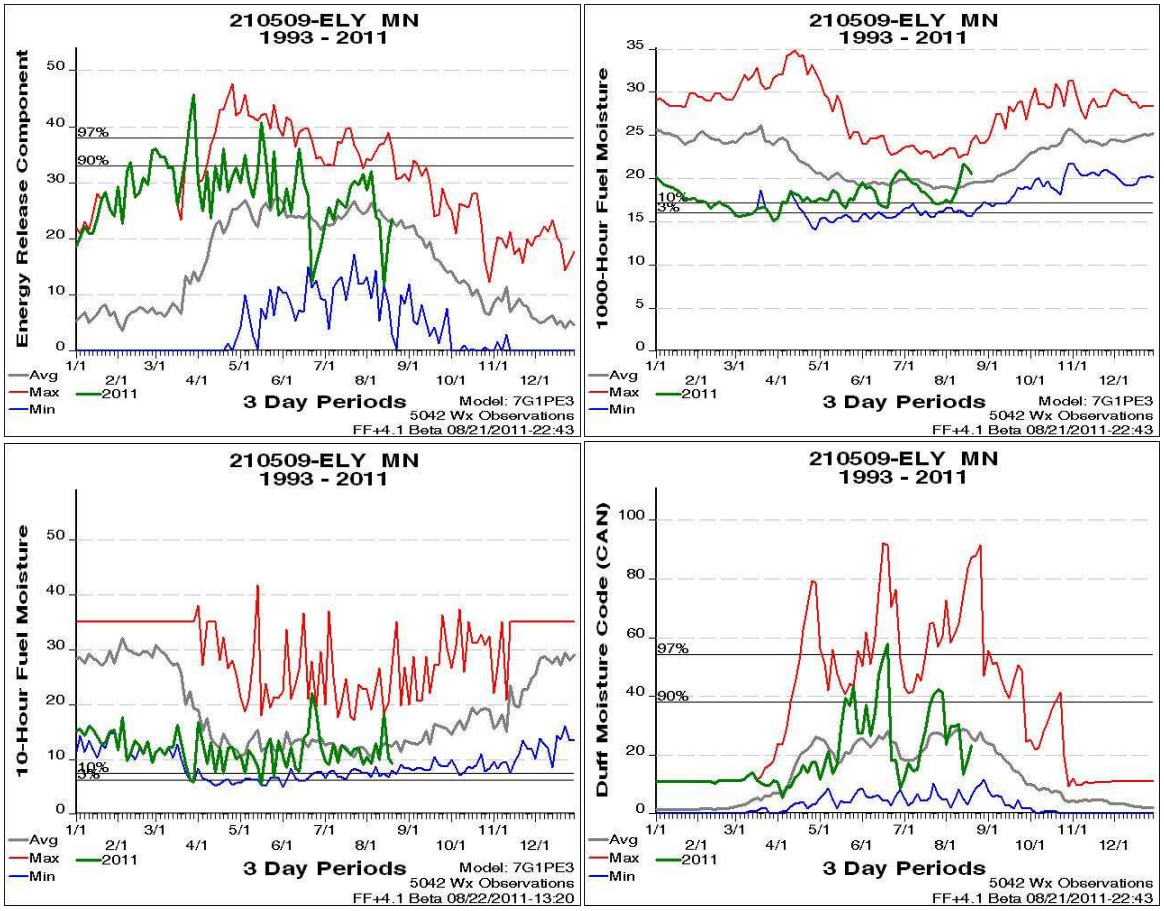

Figure A3. Seasonal graphs of Energy Release Component, 1000-hour Fuel Moisture, 10-Hour Fuel Moisture, and Duff Moisture Code. These are indicators of fuel flammability and are displayed in a way that demonstrates seasonal changes with comparison of most severe ever recorded (red), least severe ever recorded (blue), average (gray) and 2011 (green) values.

1000-Hour: Dead fuel moisture content in fuel (3"-9" in diameter) that takes 1000 hours to lose or gain 63% of the difference between the dead fuel itself and the surrounding atmosphere. Fuel moisture content in this size class fuel changes slowly over the fire season. This index is an indicator of the contribution to intensity and duration large fuels (such as logs from windthrown trees) provide. As these fuels become drier, fires become more difficult to contain fully extinguish.

10-Hour: Dead fuel moisture content in fuel (1/4-1" in diameter) that takes 10 hours to lose or gain 63% of the difference between the dead fuel itself and the surrounding atmosphere. Fuel moisture content in this size class fuel changes relatively quickly from day to day as precipitation and changes in relative humidity occur. As these fuels dry, they contribute readily to fire intensity and spread rates.

ERC: Energy Release Component (ERC) is a calculated field which provides a relative index of the amount of heat (Btu) per unit area (ft²) within the flaming front at the head of a fire. The ERC is derived from predictions of the rate of heat release per unit area during flaming combustion and the duration of the flaming which are a function of the fuel model, the live fuel moistures

and the 1000-hour timelag fuel moisture. The ERC is very sensitive to the fuel model characteristics - loading, compaction, particle size, heat of combustion and mineral content. The condition of the larger fuels has a greater influence on the component than the finer fuels. The scale for ERC values is open ended. ERC provides a view of how intense a fire may burn and how difficult it might be to control it.

Duff Moisture Code (DMC)

This is an index of the moisture of the loosely compact organic layers at a depth of 2-4 inches.

Initial Spread Index (ISI)

This is based on the FFMC and the wind speed. It provides a relative numerical rating of the expected rate of spread. This is similar to the NFDRS Spread Component.

Buildup Index (BUI)

This index is based on the DC and the DMC. It provides a relative indication of the amount of fuel available for combustion. This is somewhat similar to the NFDRS Energy Release Component. It doesn't predict what a given day might be like, but does relate well to the dryness of the fuels.

Fire Weather Index (FWI)

This combines the BUI and the ISI to give a relative numerical rating of fire intensity. It can be compared to the NFDRS Burning Index.

When evaluating the information from these two drought indicators along with weather observations and weather forecasts, it appeared that conditions in the fire area were slightly drier than average but would return to average within a short time.

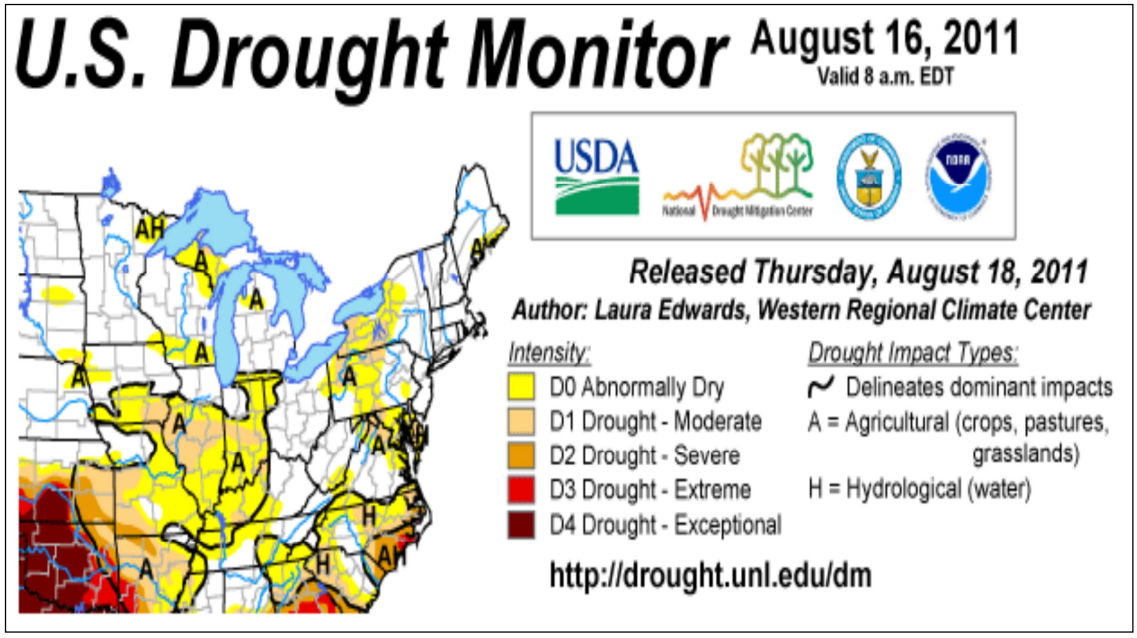

Figure A4. The U.S. Drought Monitor a large-scale indicator of current conditions. The Pagami Creek Fire lies in a yellow shaded area designated as abnormally dry as of August 16, 2011. Abnormally dry is the least severe of five levels of drought.

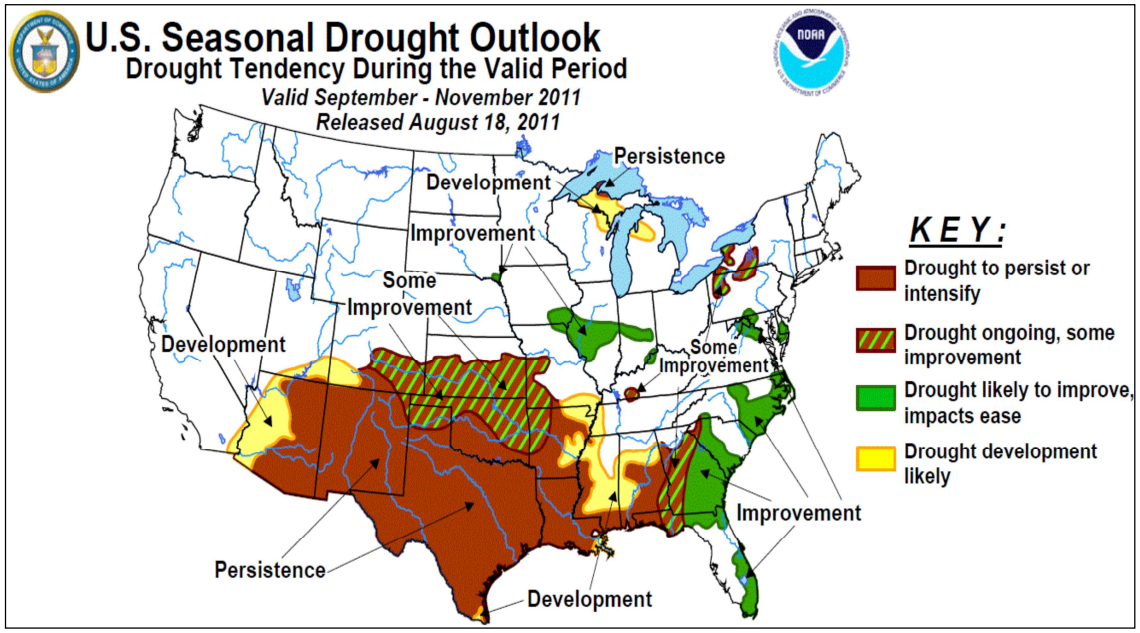

Figure A5. The U.S. Seasonal Drought Outlook is a forecast of possible drought conditions produced by the NOAA National Climate Center. This forecast did not indicate any abnormal drought or the development of drought conditions when produced on August 18, 2011 for the forecast period of September through November, 2011.

Each month the National Interagency Fire Center Predictive Services Unit produces a three month forecast for large wildfire occurrence for the United States. The map below provides an indication of likely departure from average large wildfire activity. There was no evidence at the time this forecast was issued (August 1, 2011) to indicate any unusually severe conditions in northern Minnesota which might support large fire growth.

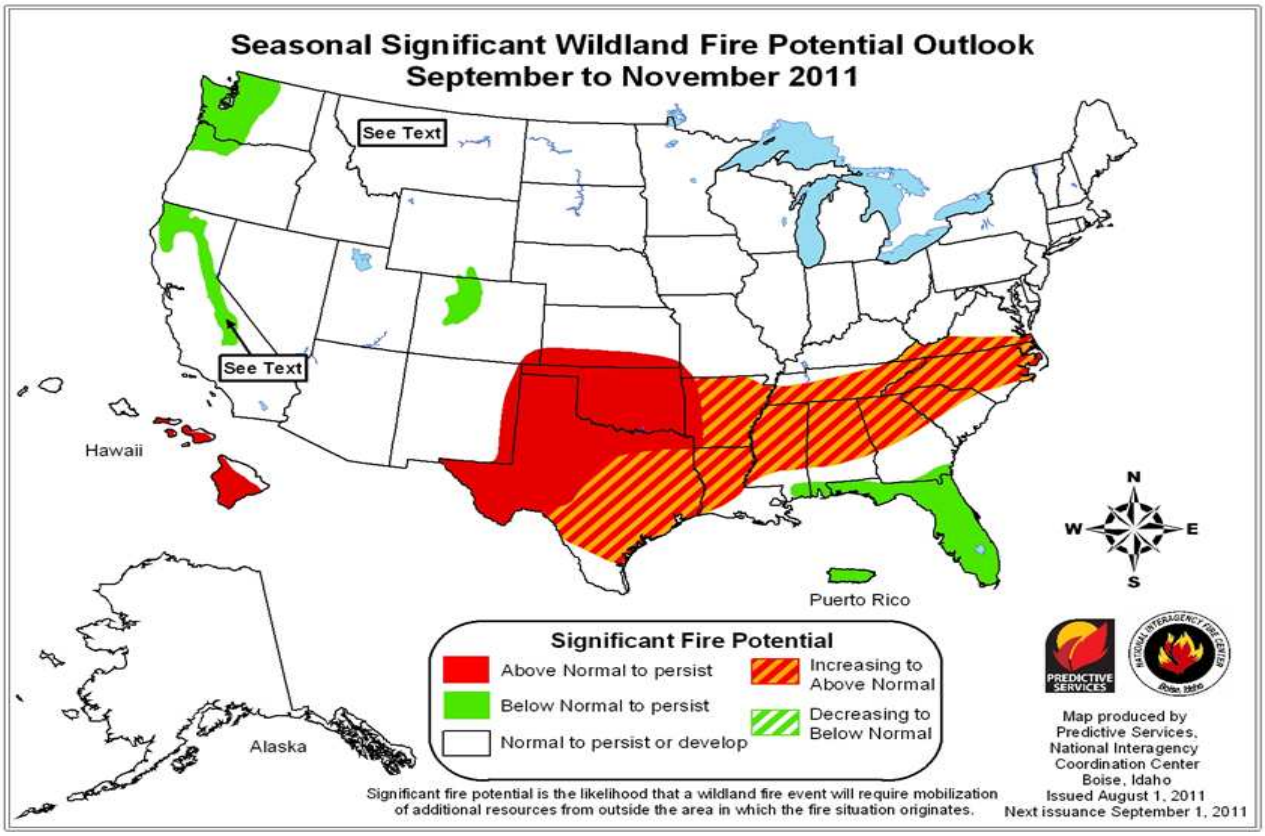

Figure A6. Seasonal significant wildland fire potential outlook for September through November 2011. Issued by NIFC Predictive Services Unit on August 1, 2011.